WOOD BUFFALO NATIONAL PARK

ANALYSIS OF BISON MARROW FAT

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May 1982

CANADIAN WILDLIFE SERVICE

Analysis of bison marrow fat data, Wood Buffalo National Park

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ABSTRACT

Kingsley, M.C.S. 1982. Analysis of bison marrow fat data, Wood Buffalo National Park. Canadian Wildlife Service, unpublished. 5 pp.

Femur marrow fat percentages from 72 wolf-killed bison were regressed on binary dummy variables representing age class, sex, and season of winter (early, mid, late). Males had lower mean and more scattered values than females and immatures.

INTRODUCTION

This report presents the analysis of a series of measurements of femur marrow fat from wolf-killed bison in Wood Buffalo National Park. The data were supplied by S. Oosenbrug and L. Carbyn. The question of principal interest was whether marrow fat percentage in wolf kills decreased as the winter progressed.

DATA

The data supplied were 72 single measures of percent fat in femur marrow from bison killed by wolves in Wood Buffalo National Park. Each marrow fat reading was accompanied by:

- an 'Area' designation: I or II;
- a year: 77-78 to 80-81;
- the age class of the bison: calf, yearling, 2-4 years old, 5-10 years old, 11+ years old;
- the sex of the bison, except for the two youngest age classes;
- the season in which killed: 'early, 'mid' or 'late' winter.

METHOD

The method used was 'dummy' variable multiple linear regression. Dummy binary variables were created for year (4 variables), age class (five variables), sex (three variables), season (three variables); inspection of a plot of the data showed no apparent difference between areas. The regressions were carried out stepwise forward, with an entry significance level of 0.05 and an exit level of 0.10. All the binary variables above were offered, and a numerical form of the 'season' variable (early winter = 1, midwinter = 2, late winter = 3) was also offered to test for a progressive change in percent fat through the winter.

Absolute values of the residuals from the first regression were regressed against the same independent variables. Independence of sex and season was checked by χ^2 test on a two-way contingency table.

RESULTS AND DISCUSSION

The only variable entering the regression at 5% was 'sex = male' (Table 1). Two other variables had significance levels beyond 10%: 'age 11+' and 'season'.

Table 1. Variables entering regression of femur marrow fat percentage.

Variable	Coefficient	Significance (%)
Constant	77.5	0.0
Sex = male	-10.4	2.5
Variables clost to entering		
Age 11+	-ve	9.1
Season	-ve	6.0

The significance levels obtained in stepwise regression usually overstate the true values. However, the results obtained here are at least biologically explainable, with males (owing to the stresses of the rut) and the oldest animals (owing to age) having lower marrow fat values.

Regression of the absolute residual from the first regression against the same independent variables gave the results of Table 2. Males show a greater scatter of values about the regression than the other two sex classes, perhaps because the rut stresses more the more competitive and sexually successful.

Contingency table analysis showed sex and season of kill to be much better than independent: the data set is very well balanced on these two variables.

Table 2. Variables entering regression of absolute residual from first regression.

Variables	Coefficient	Significance (%)
Constant	10.7	0.0
Sex - male	8.5	0.36

- no other variables were even close to entering.

The indications are thus that the only independent variable associated with marrow fat percentage is sex, males having lower mean value and more scattered values than females or immatures. There is little evidence for a drop in marrow fat percentage through the winter.

It should be remembered that the significance levels obtained from stepwise multiple regression overstate true values, and may be spurious; also that these results apply only to wolf kills, presumably selected by the wolves on some basis, and may not generalise to the rest of the population.

CONCLUSIONS

There was little evidence for lower fat levels in femur marrow in wolf-killed bison in Wood Buffalo National Park in later winter. Males showed levels about 10 percentage points lower than females and immatures, and showed greater scatter of values.

POOR

QUALITY

ORIGINAL